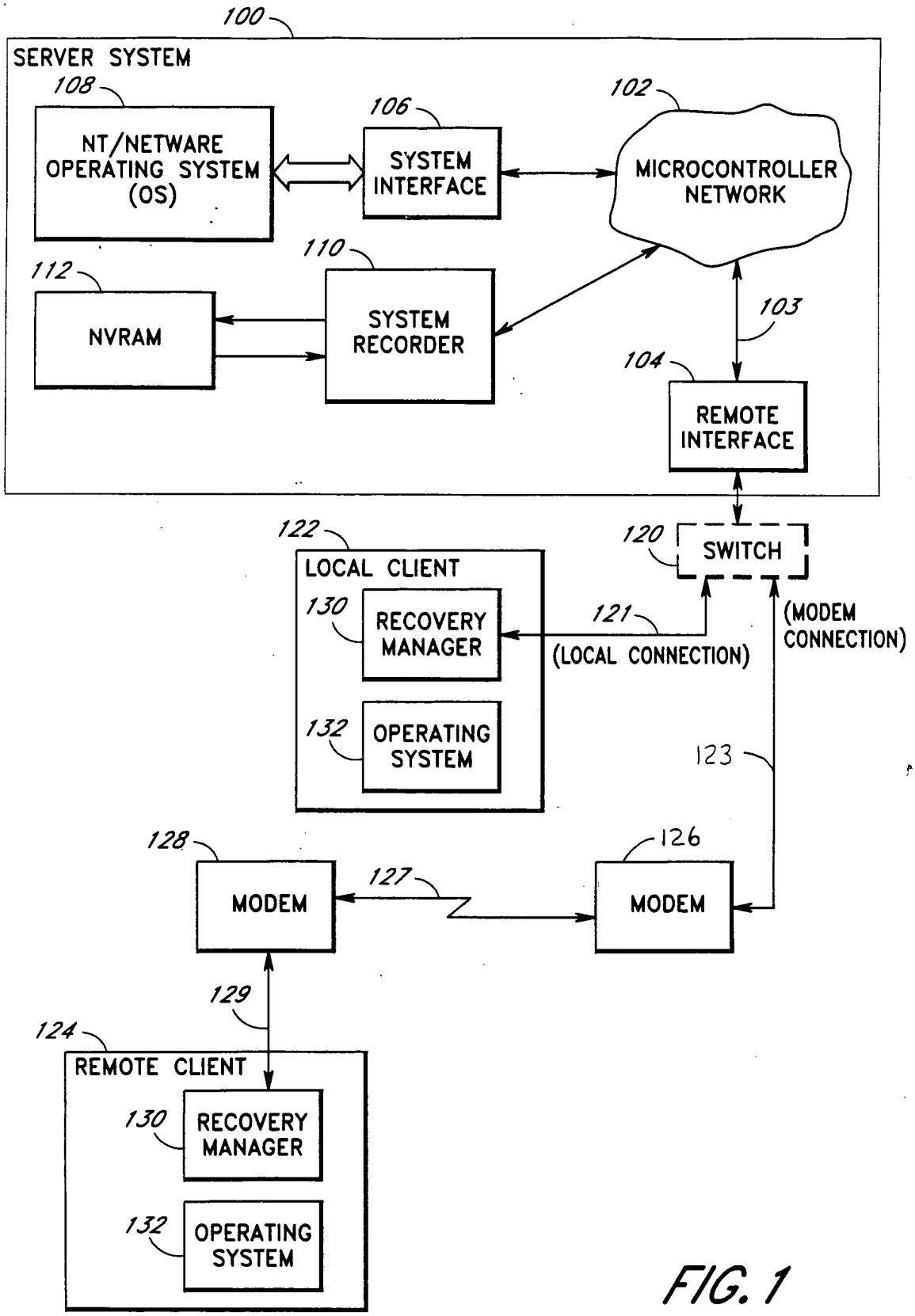
100
SERVER SYSTEM
108
NT/NETWARE OPERATING SYSTEM (OS)
106
SYSTEM INTERFACE
102
MICROCONTROLLER NETWORK
110
112
NVRAM
SYSTEM RECORDER
103
104
REMOTE INTERFACE
122
120
SWITCH
LOCAL CLIENT
130
RECOVERY MANAGER
121
(LOCAL CONNECTION)
(MODEM CONNECTION)
132
OPERATING SYSTEM
123
128
126
MODEM
127
MODEM
129
124
REMOTE CLIENT
130
RECOVERY MANAGER
132
OPERATING SYSTEM

FIG. 1

26TOOT "4E2h680

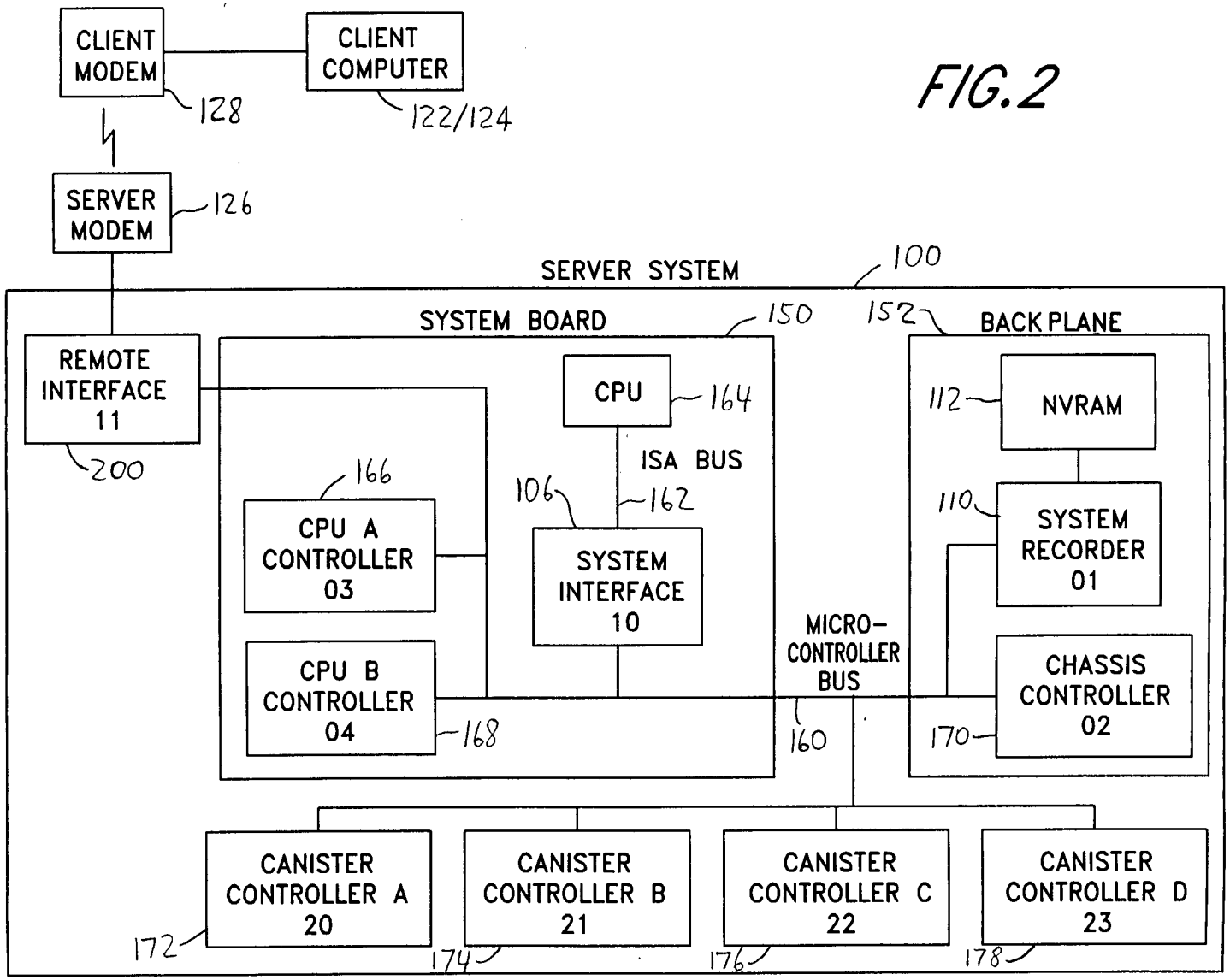

FIG. 2

Remote Interface Serial Protocol Message Formats

201

Request:

202

SOM	Seq. #	TYPE	Data	...	Check	EOM

206 208 210 212 214 216

Response:

204

SOM	Seq. #	STATUS	Data	...	Check	EOM

218

Event Interrupt

INT

220

FIG. 3

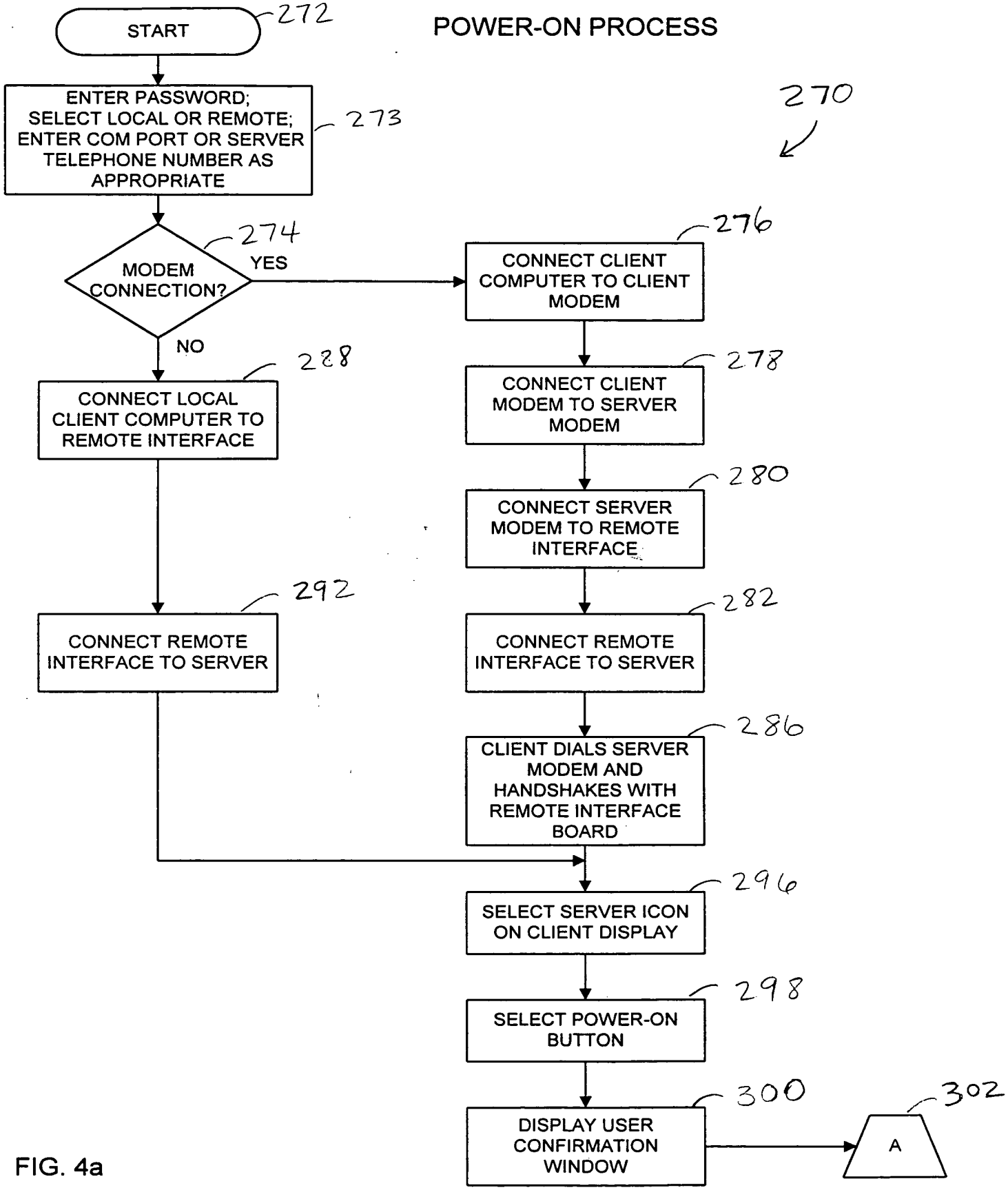
POWER-ON PROCESS
270
START
272
ENTER PASSWORD; SELECT LOCAL OR REMOTE; ENTER COM PORT OR SERVER TELEPHONE NUMBER AS APPROPRIATE
273
MODEM CONNECTION?
274
YES
NO
CONNECT CLIENT COMPUTER TO CLIENT MODEM
276
CONNECT CLIENT MODEM TO SERVER MODEM
278
CONNECT SERVER MODEM TO REMOTE INTERFACE
280
CONNECT REMOTE INTERFACE TO SERVER
282
CONNECT LOCAL CLIENT COMPUTER TO REMOTE INTERFACE
288
CONNECT REMOTE INTERFACE TO SERVER
292
CLIENT DIALS SERVER MODEM AND HANDSHAKES WITH REMOTE INTERFACE BOARD
286
SELECT SERVER ICON ON CLIENT DISPLAY
296
SELECT POWER-ON BUTTON
298
DISPLAY USER CONFIRMATION WINDOW
300
A
302

FIG. 4a

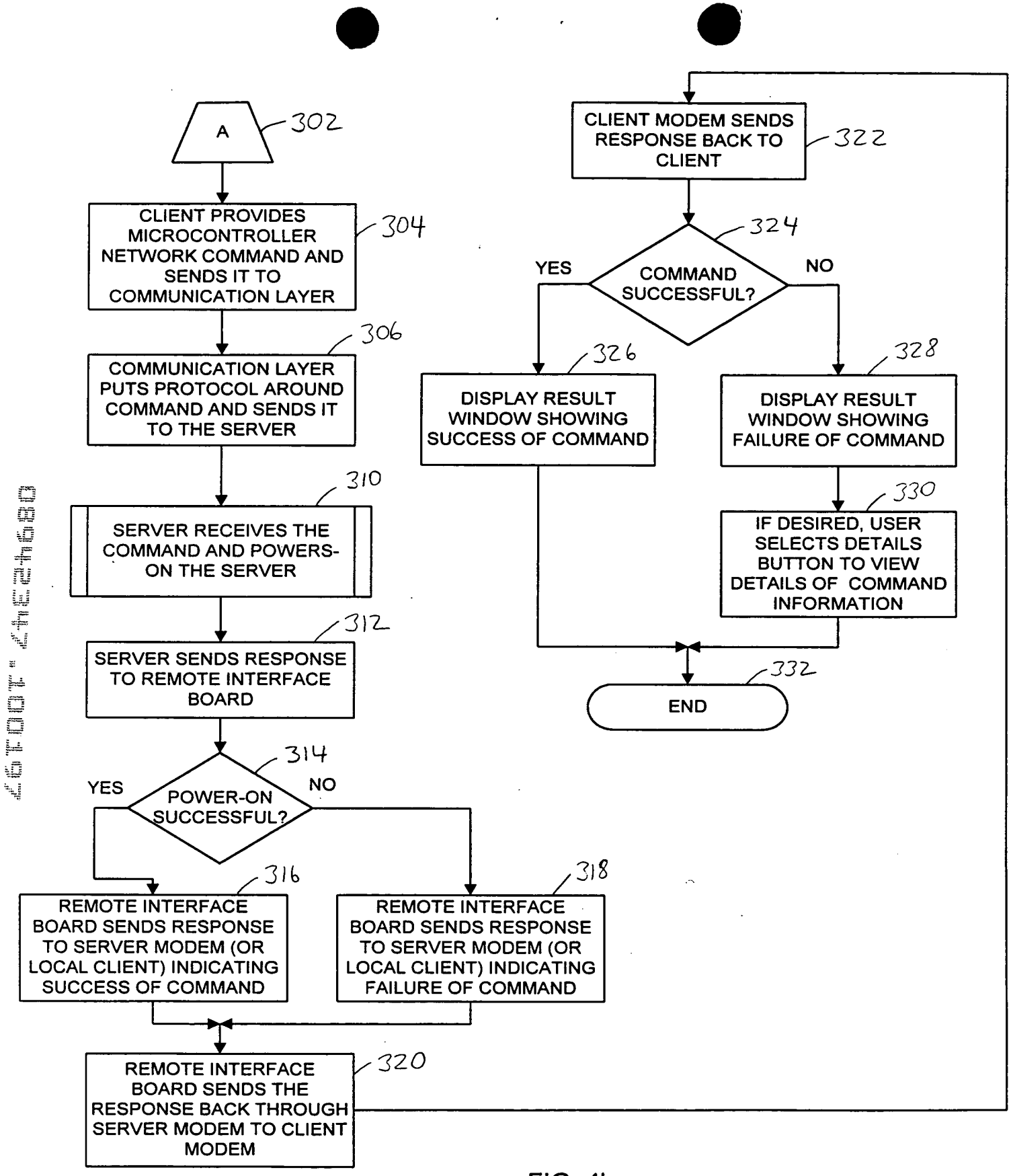
A
302
CLIENT PROVIDES MICROCONTROLLER NETWORK COMMAND AND SENDS IT TO COMMUNICATION LAYER
304
COMMUNICATION LAYER PUTS PROTOCOL AROUND COMMAND AND SENDS IT TO THE SERVER
306
SERVER RECEIVES THE COMMAND AND POWERS-ON THE SERVER
310
SERVER SENDS RESPONSE TO REMOTE INTERFACE BOARD
312
POWER-ON SUCCESSFUL?
314
YES
NO
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING SUCCESS OF COMMAND
316
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING FAILURE OF COMMAND
318
REMOTE INTERFACE BOARD SENDS THE RESPONSE BACK THROUGH SERVER MODEM TO CLIENT MODEM
320
CLIENT MODEM SENDS RESPONSE BACK TO CLIENT
322
COMMAND SUCCESSFUL?
324
YES
NO
DISPLAY RESULT WINDOW SHOWING SUCCESS OF COMMAND
326
DISPLAY RESULT WINDOW SHOWING FAILURE OF COMMAND
328
IF DESIRED, USER SELECTS DETAILS BUTTON TO VIEW DETAILS OF COMMAND INFORMATION
330
END
332

FIG. 4b

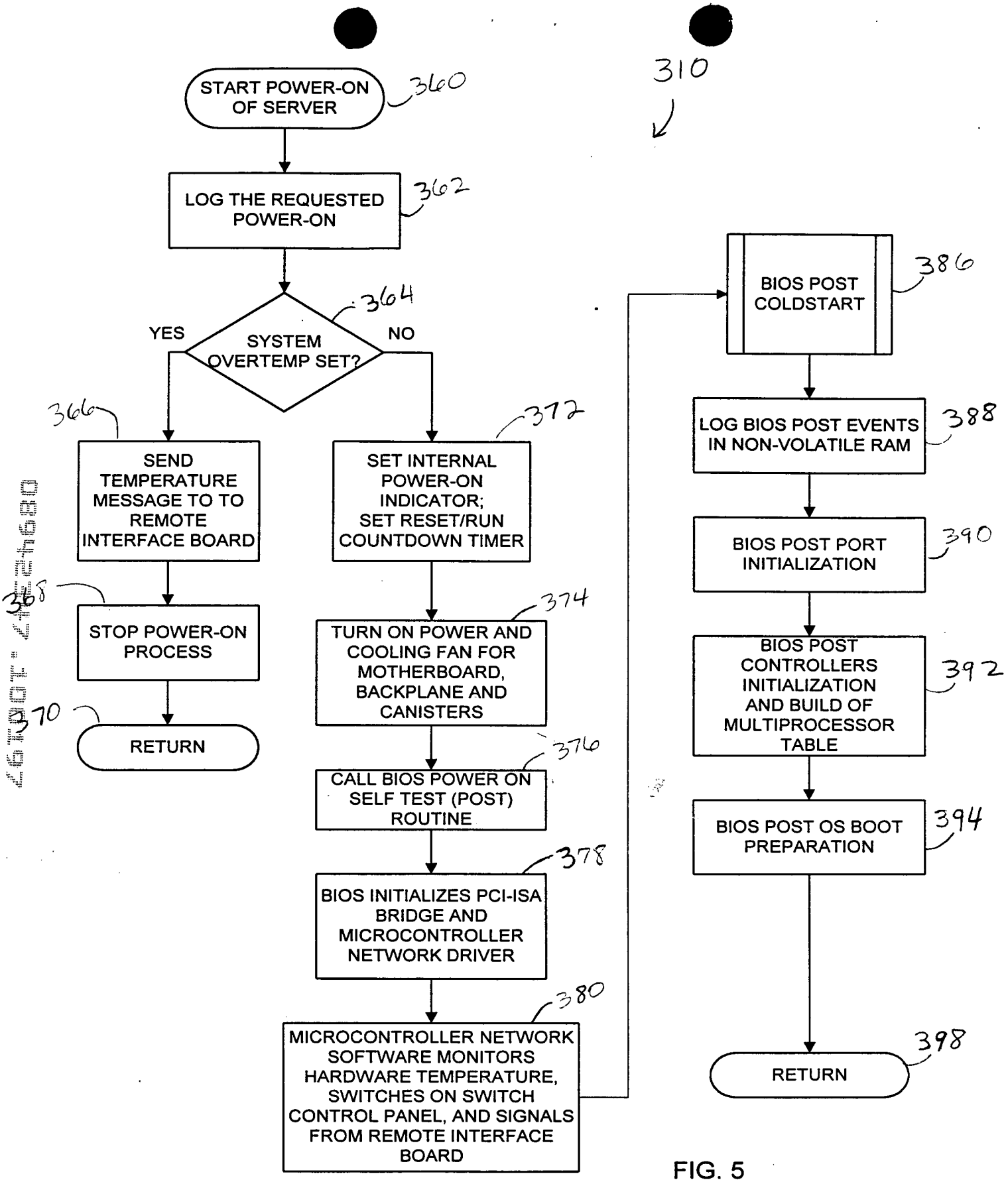
310
START POWER-ON OF SERVER
360
LOG THE REQUESTED POWER-ON
362
SYSTEM OVERTEMP SET?
364
YES
NO
366
SEND TEMPERATURE MESSAGE TO TO REMOTE INTERFACE BOARD
368
STOP POWER-ON PROCESS
370
RETURN
372
SET INTERNAL POWER-ON INDICATOR; SET RESET/RUN COUNTDOWN TIMER
374
TURN ON POWER AND COOLING FAN FOR MOTHERBOARD, BACKPLANE AND CANISTERS
376
CALL BIOS POWER ON SELF TEST (POST) ROUTINE
378
BIOS INITIALIZES PCI-ISA BRIDGE AND MICROCONTROLLER NETWORK DRIVER
380
MICROCONTROLLER NETWORK SOFTWARE MONITORS HARDWARE TEMPERATURE, SWITCHES ON SWITCH CONTROL PANEL, AND SIGNALS FROM REMOTE INTERFACE BOARD
386
BIOS POST COLDSTART
388
LOG BIOS POST EVENTS IN NON-VOLATILE RAM
390
BIOS POST PORT INITIALIZATION
392
BIOS POST CONTROLLERS INITIALIZATION AND BUILD OF MULTIPROCESSOR TABLE
394
BIOS POST OS BOOT PREPARATION
398
RETURN

FIG. 5

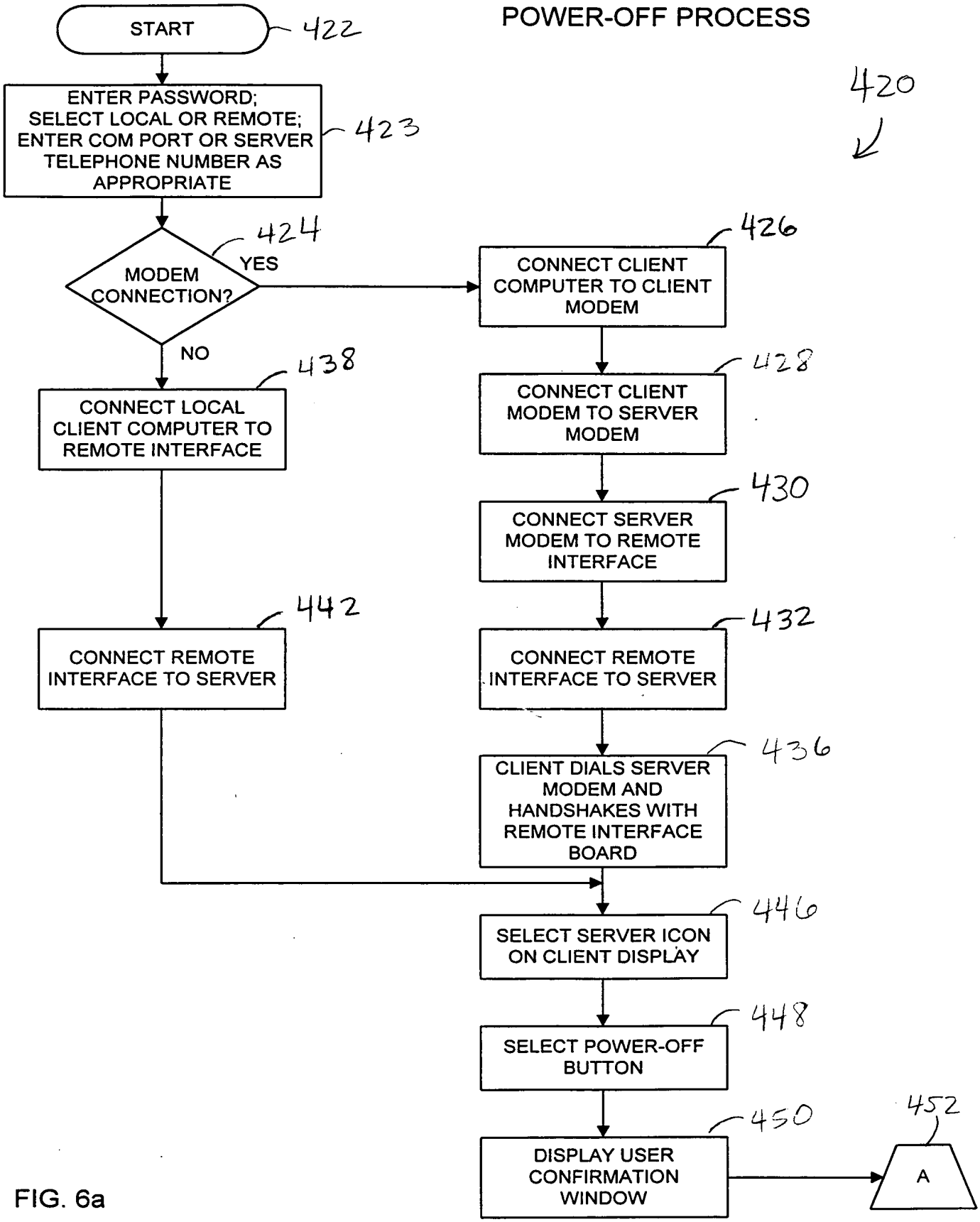
POWER-OFF PROCESS
420
START
422
ENTER PASSWORD; SELECT LOCAL OR REMOTE; ENTER COM PORT OR SERVER TELEPHONE NUMBER AS APPROPRIATE
423
MODEM CONNECTION?
424
YES
NO
CONNECT CLIENT COMPUTER TO CLIENT MODEM
426
CONNECT CLIENT MODEM TO SERVER MODEM
428
CONNECT SERVER MODEM TO REMOTE INTERFACE
430
CONNECT REMOTE INTERFACE TO SERVER
432
CLIENT DIALS SERVER MODEM AND HANDSHAKES WITH REMOTE INTERFACE BOARD
436
CONNECT LOCAL CLIENT COMPUTER TO REMOTE INTERFACE
438
CONNECT REMOTE INTERFACE TO SERVER
442
SELECT SERVER ICON ON CLIENT DISPLAY
446
SELECT POWER-OFF BUTTON
448
DISPLAY USER CONFIRMATION WINDOW
450
A
452

FIG. 6a

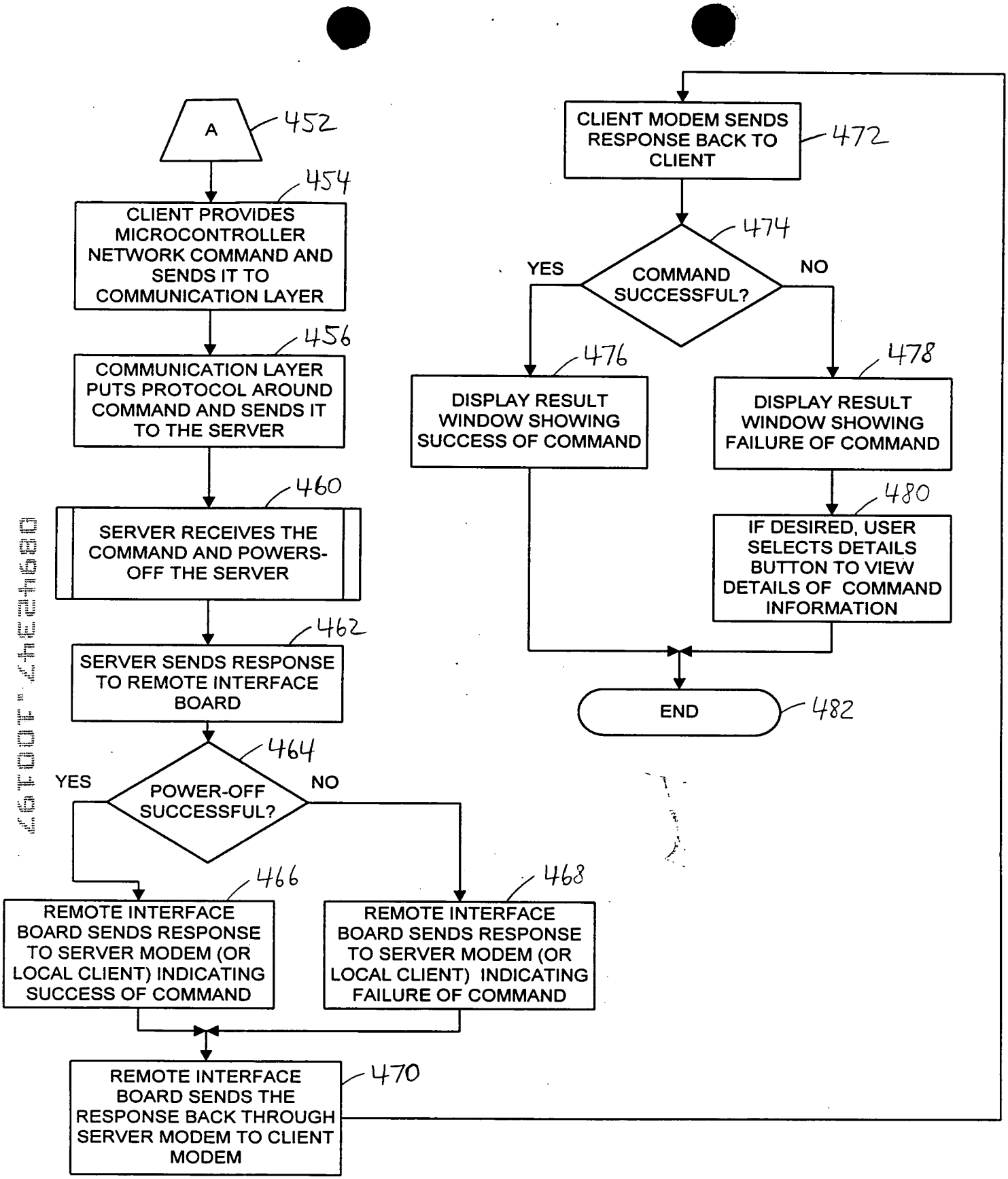
A
452
454
CLIENT PROVIDES MICROCONTROLLER NETWORK COMMAND AND SENDS IT TO COMMUNICATION LAYER
456
COMMUNICATION LAYER PUTS PROTOCOL AROUND COMMAND AND SENDS IT TO THE SERVER
460
SERVER RECEIVES THE COMMAND AND POWERS-OFF THE SERVER
462
SERVER SENDS RESPONSE TO REMOTE INTERFACE BOARD
464
YES
POWER-OFF SUCCESSFUL?
NO
466
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING SUCCESS OF COMMAND
468
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING FAILURE OF COMMAND
470
REMOTE INTERFACE BOARD SENDS THE RESPONSE BACK THROUGH SERVER MODEM TO CLIENT MODEM
CLIENT MODEM SENDS RESPONSE BACK TO CLIENT
472
474
YES
COMMAND SUCCESSFUL?
NO
476
DISPLAY RESULT WINDOW SHOWING SUCCESS OF COMMAND
478
DISPLAY RESULT WINDOW SHOWING FAILURE OF COMMAND
480
IF DESIRED, USER SELECTS DETAILS BUTTON TO VIEW DETAILS OF COMMAND INFORMATION
END
482

FIG. 6b

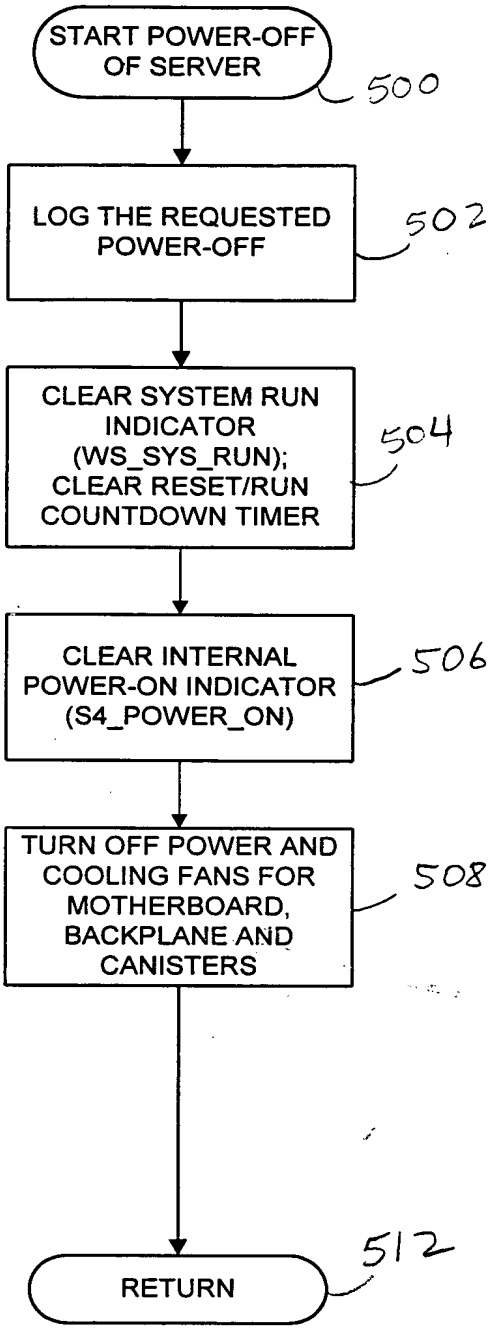

FIG. 7

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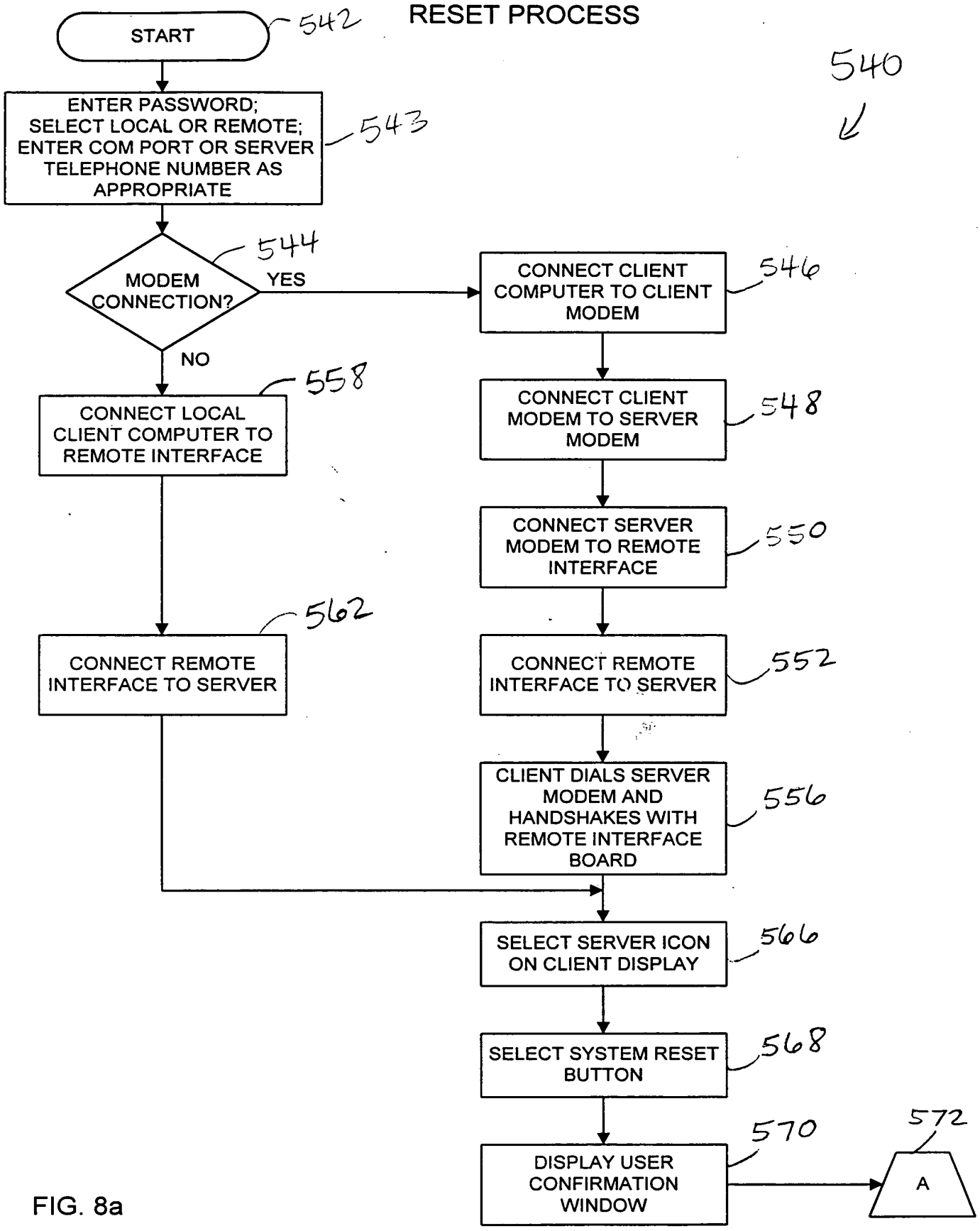
RESET PROCESS
540
START
542
ENTER PASSWORD; SELECT LOCAL OR REMOTE; ENTER COM PORT OR SERVER TELEPHONE NUMBER AS APPROPRIATE
543
MODEM CONNECTION?
544
YES
NO
CONNECT CLIENT COMPUTER TO CLIENT MODEM
546
CONNECT CLIENT MODEM TO SERVER MODEM
548
CONNECT SERVER MODEM TO REMOTE INTERFACE
550
CONNECT REMOTE INTERFACE TO SERVER
552
CLIENT DIALS SERVER MODEM AND HANDSHAKES WITH REMOTE INTERFACE BOARD
556
CONNECT LOCAL CLIENT COMPUTER TO REMOTE INTERFACE
558
CONNECT REMOTE INTERFACE TO SERVER
562
SELECT SERVER ICON ON CLIENT DISPLAY
566
SELECT SYSTEM RESET BUTTON
568
DISPLAY USER CONFIRMATION WINDOW
570
A
572

FIG. 8a

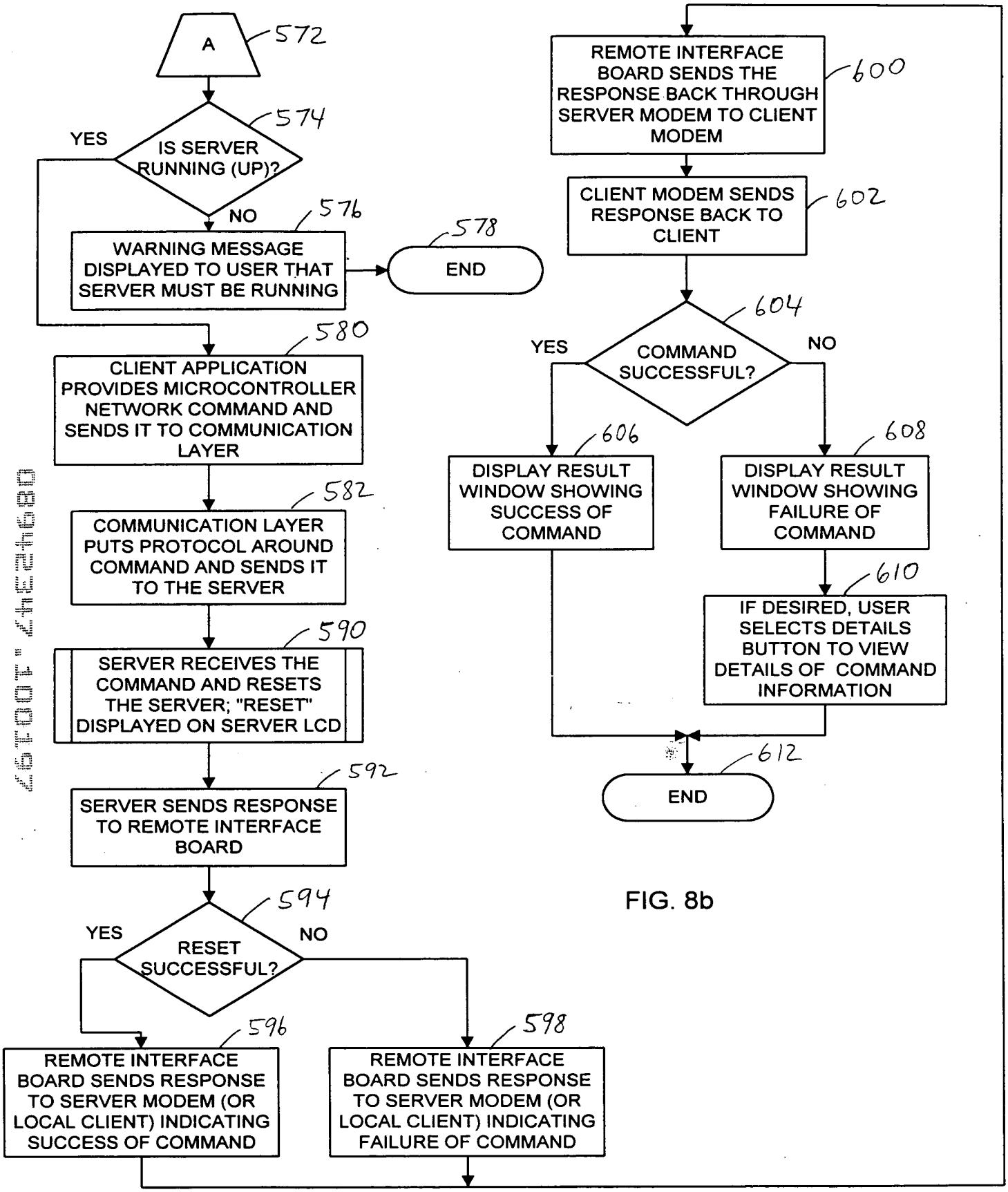
A
572
IS SERVER RUNNING (UP)?
574
YES
NO
WARNING MESSAGE DISPLAYED TO USER THAT SERVER MUST BE RUNNING
576
END
578
CLIENT APPLICATION PROVIDES MICROCONTROLLER NETWORK COMMAND AND SENDS IT TO COMMUNICATION LAYER
580
COMMUNICATION LAYER PUTS PROTOCOL AROUND COMMAND AND SENDS IT TO THE SERVER
582
SERVER RECEIVES THE COMMAND AND RESETS THE SERVER; "RESET" DISPLAYED ON SERVER LCD
590
SERVER SENDS RESPONSE TO REMOTE INTERFACE BOARD
592
RESET SUCCESSFUL?
594
YES
NO
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING SUCCESS OF COMMAND
596
REMOTE INTERFACE BOARD SENDS RESPONSE TO SERVER MODEM (OR LOCAL CLIENT) INDICATING FAILURE OF COMMAND
598
REMOTE INTERFACE BOARD SENDS THE RESPONSE BACK THROUGH SERVER MODEM TO CLIENT MODEM
600
CLIENT MODEM SENDS RESPONSE BACK TO CLIENT
602
COMMAND SUCCESSFUL?
604
YES
NO
DISPLAY RESULT WINDOW SHOWING SUCCESS OF COMMAND
606
DISPLAY RESULT WINDOW SHOWING FAILURE OF COMMAND
608
IF DESIRED, USER SELECTS DETAILS BUTTON TO VIEW DETAILS OF COMMAND INFORMATION
610
END
612

FIG. 8b

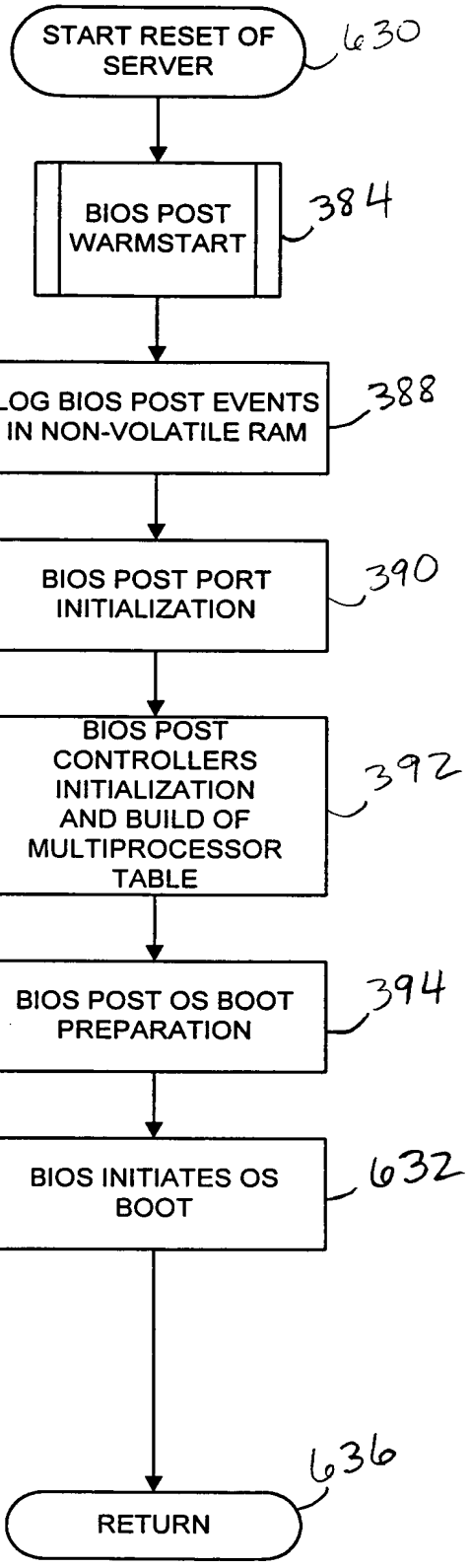
START RESET OF SERVER
630
590
BIOS POST WARMSTART
384
LOG BIOS POST EVENTS IN NON-VOLATILE RAM
388
BIOS POST PORT INITIALIZATION
390
BIOS POST CONTROLLERS INITIALIZATION AND BUILD OF MULTIPROCESSOR TABLE
392
BIOS POST OS BOOT PREPARATION
394
BIOS INITIATES OS BOOT
632
RETURN
636

FIG. 9

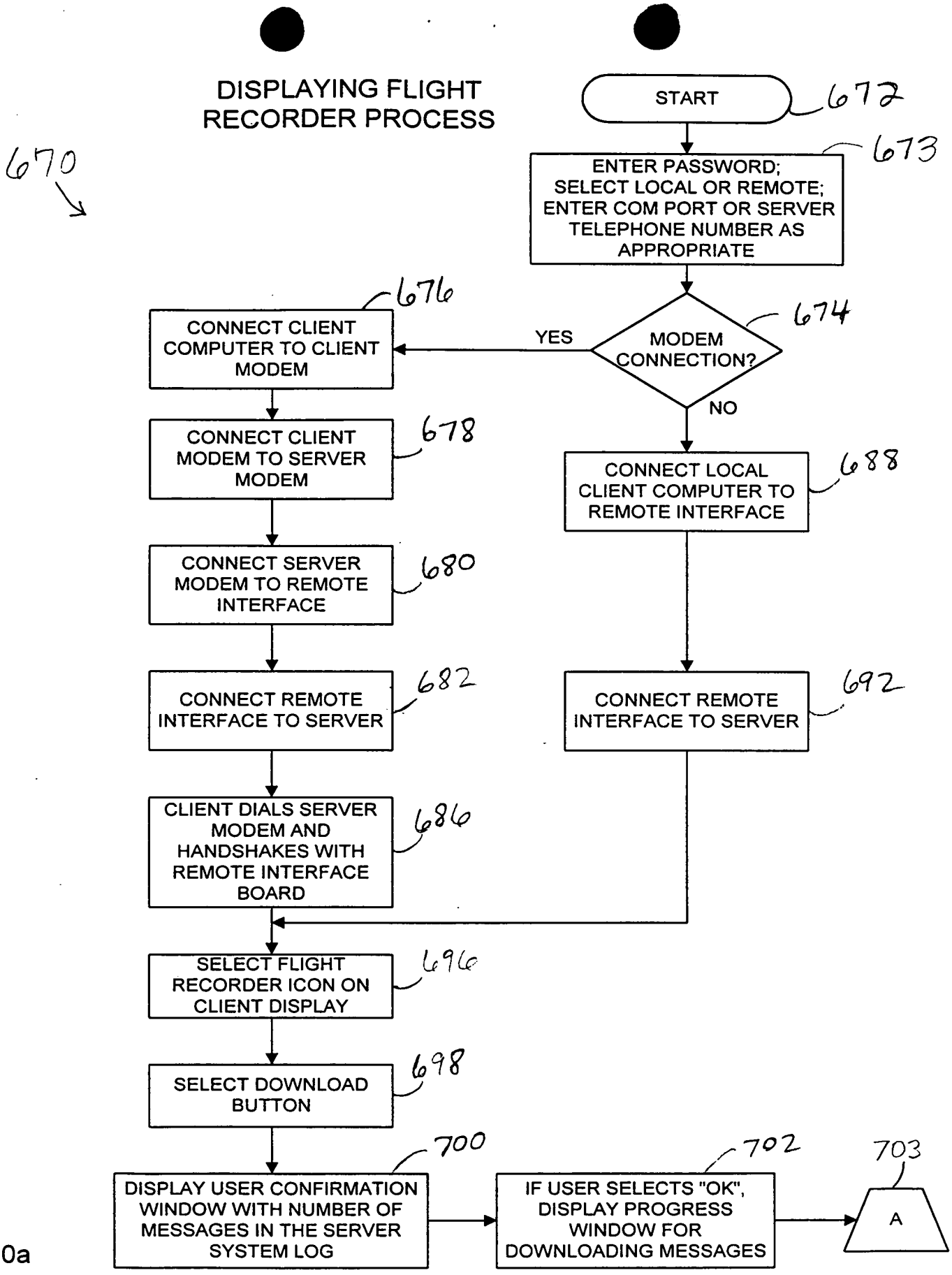
DISPLAYING FLIGHT RECORDER PROCESS
670
START
672
ENTER PASSWORD; SELECT LOCAL OR REMOTE; ENTER COM PORT OR SERVER TELEPHONE NUMBER AS APPROPRIATE
673
MODEM CONNECTION?
674
YES
NO
CONNECT CLIENT COMPUTER TO CLIENT MODEM
676
CONNECT CLIENT MODEM TO SERVER MODEM
678
CONNECT SERVER MODEM TO REMOTE INTERFACE
680
CONNECT REMOTE INTERFACE TO SERVER
682
CLIENT DIALS SERVER MODEM AND HANDSHAKES WITH REMOTE INTERFACE BOARD
686
CONNECT LOCAL CLIENT COMPUTER TO REMOTE INTERFACE
688
CONNECT REMOTE INTERFACE TO SERVER
692
SELECT FLIGHT RECORDER ICON ON CLIENT DISPLAY
696
SELECT DOWNLOAD BUTTON
698
DISPLAY USER CONFIRMATION WINDOW WITH NUMBER OF MESSAGES IN THE SERVER SYSTEM LOG
700
IF USER SELECTS "OK", DISPLAY PROGRESS WINDOW FOR DOWNLOADING MESSAGES
702
703
A

FIG. 10a

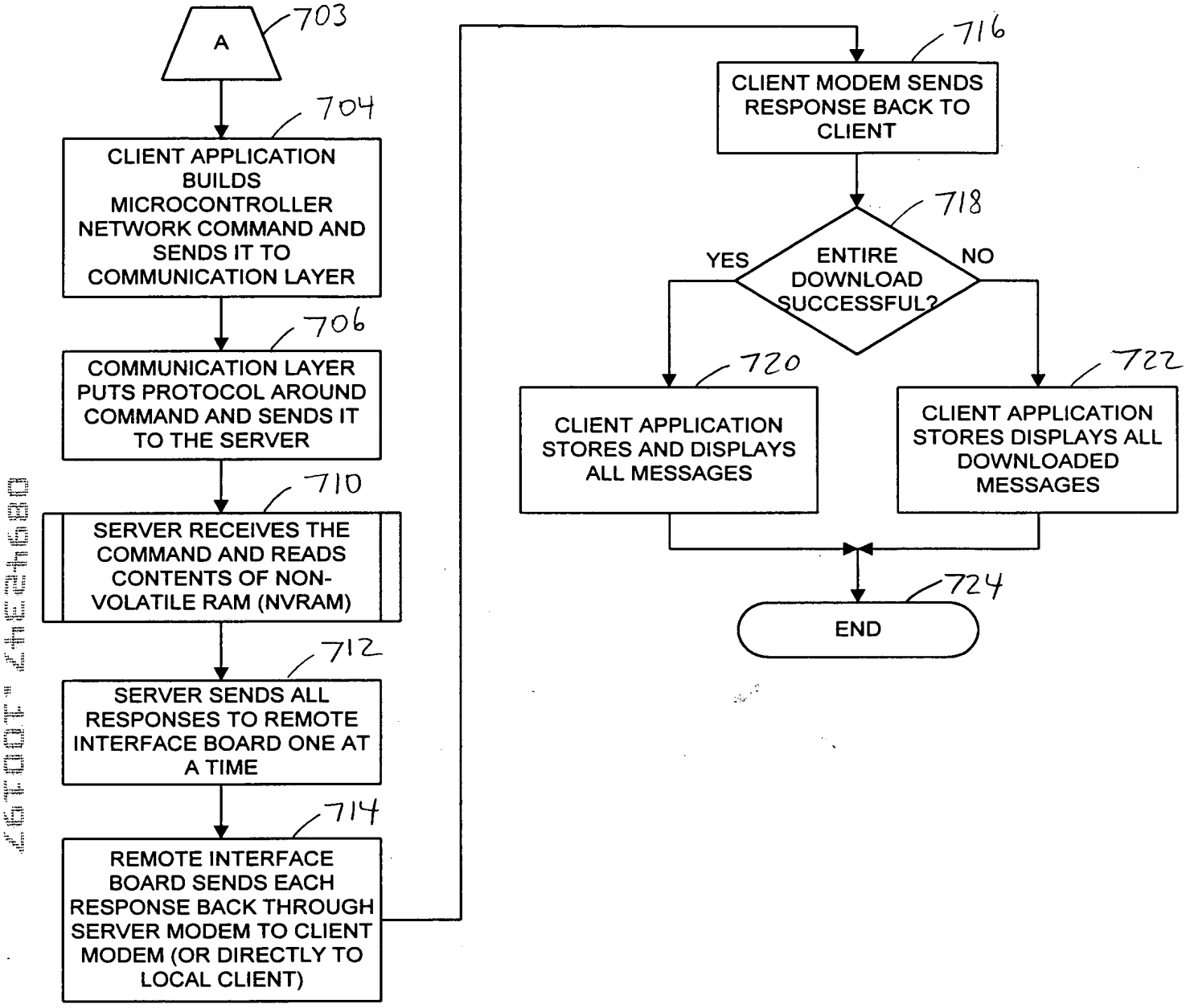
A
703
704
CLIENT APPLICATION BUILDS MICROCONTROLLER NETWORK COMMAND AND SENDS IT TO COMMUNICATION LAYER
706
COMMUNICATION LAYER PUTS PROTOCOL AROUND COMMAND AND SENDS IT TO THE SERVER
710
SERVER RECEIVES THE COMMAND AND READS CONTENTS OF NON-VOLATILE RAM (NVRAM)
712
SERVER SENDS ALL RESPONSES TO REMOTE INTERFACE BOARD ONE AT A TIME
714
REMOTE INTERFACE BOARD SENDS EACH RESPONSE BACK THROUGH SERVER MODEM TO CLIENT MODEM (OR DIRECTLY TO LOCAL CLIENT)
716
CLIENT MODEM SENDS RESPONSE BACK TO CLIENT
718
ENTIRE DOWNLOAD SUCCESSFUL?
YES
NO
720
CLIENT APPLICATION STORES AND DISPLAYS ALL MESSAGES
722
CLIENT APPLICATION STORES DISPLAYS ALL DOWNLOADED MESSAGES
724
END

FIG. 10b

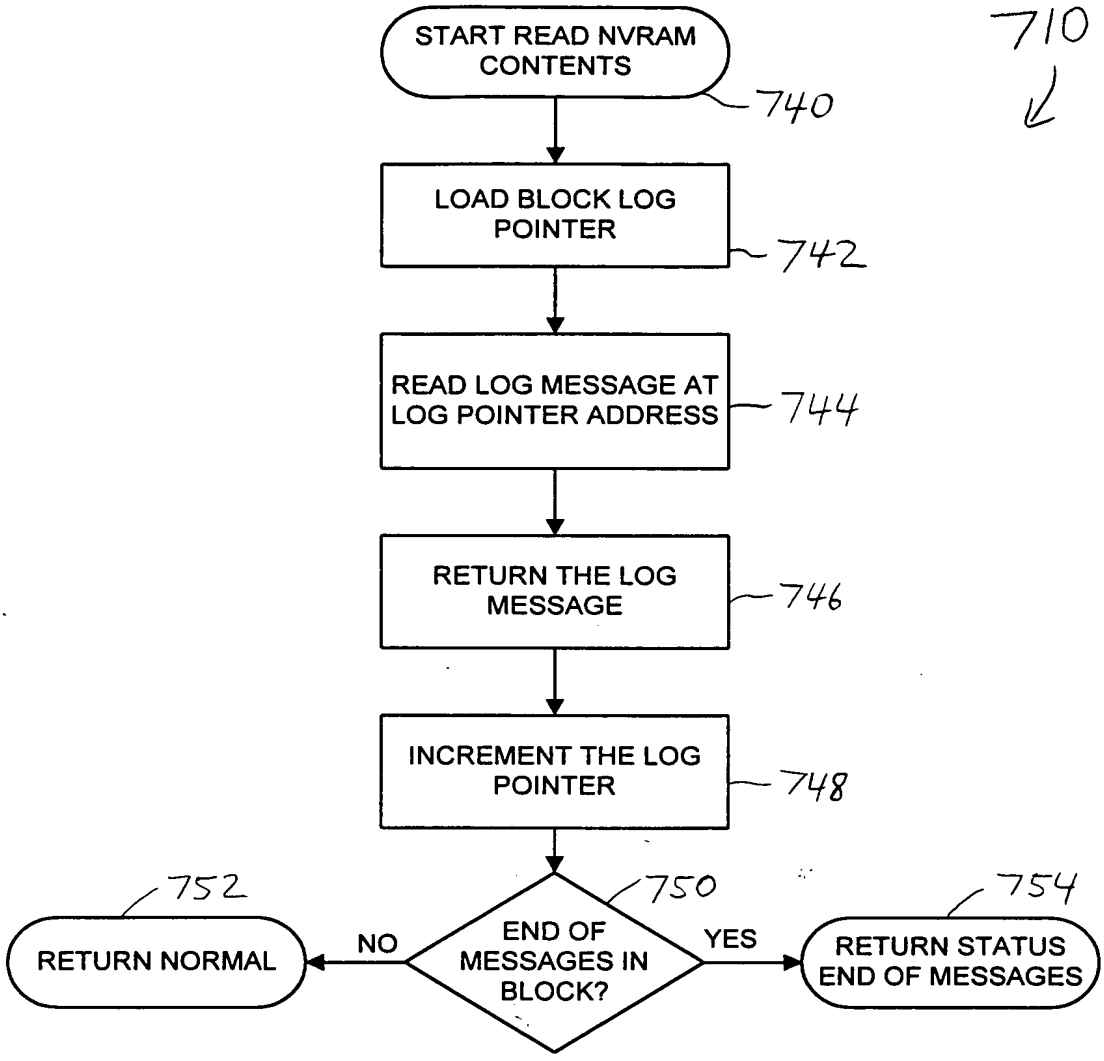
710
START READ NVRAM CONTENTS
740
LOAD BLOCK LOG POINTER
742
READ LOG MESSAGE AT LOG POINTER ADDRESS
744
RETURN THE LOG MESSAGE
746
INCREMENT THE LOG POINTER
748
END OF MESSAGES IN BLOCK?
750
NO
YES
RETURN NORMAL
752
RETURN STATUS END OF MESSAGES
754

FIG. 11

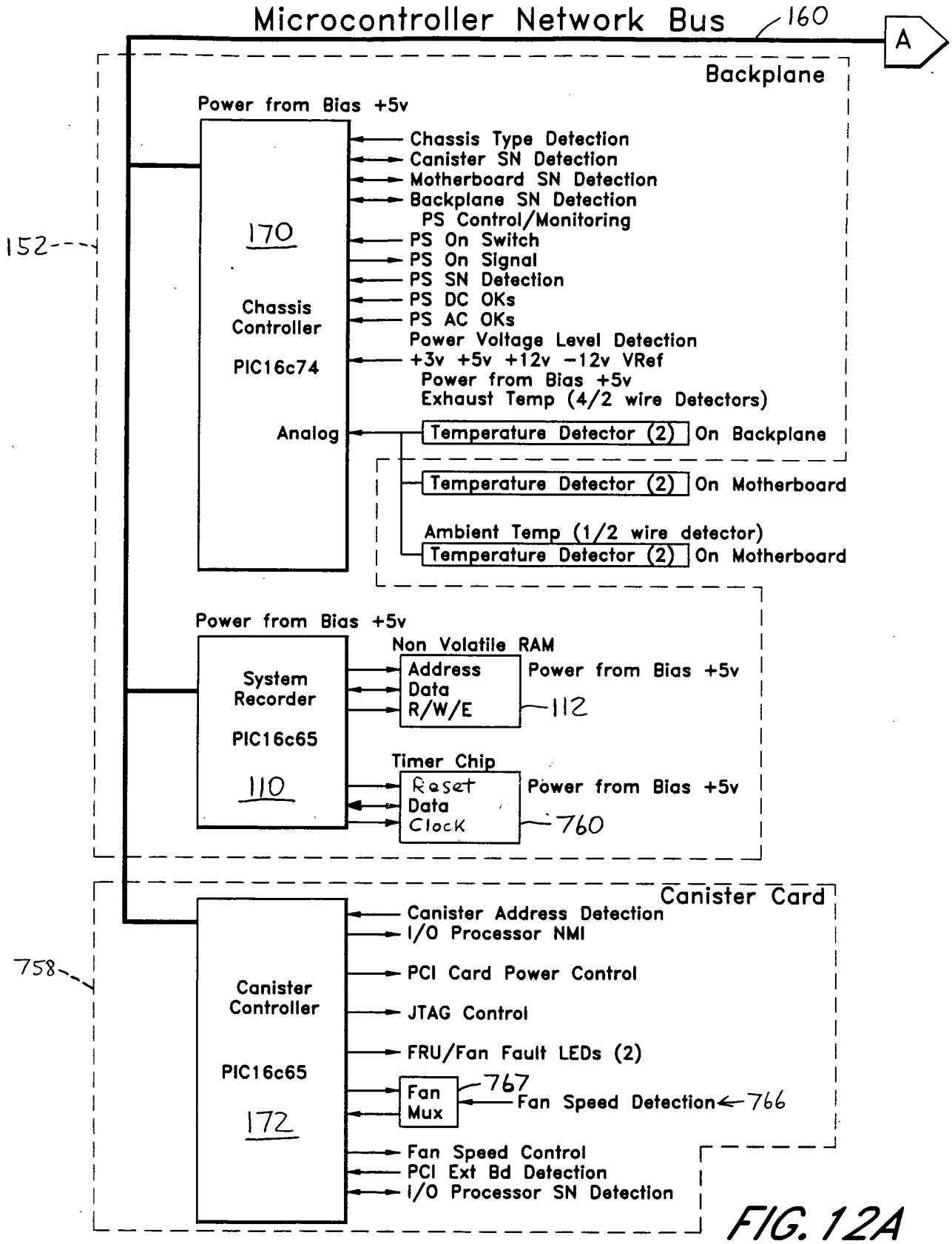
Microcontroller Network Bus
160
A
Backplane
Power from Bias +5v
152
170
Chassis Controller
PIC16c74
Analog
Chassis Type Detection
Canister SN Detection
Motherboard SN Detection
Backplane SN Detection
PS Control/Monitoring
PS On Switch
PS On Signal
PS SN Detection
PS DC OKs
PS AC OKs
Power Voltage Level Detection
+3v +5v +12v −12v VRef
Power from Bias +5v
Exhaust Temp (4/2 wire Detectors)
Temperature Detector (2) On Backplane
Temperature Detector (2) On Motherboard
Ambient Temp (1/2 wire detector)
Temperature Detector (2) On Motherboard
Power from Bias +5v
System Recorder
PIC16c65
110
Non Volatile RAM
Address
Data
R/W/E
112
Power from Bias +5v
Timer Chip
Reset
Data
Clock
760
Power from Bias +5v
Canister Card
758
Canister Controller
PIC16c65
172
Canister Address Detection
I/O Processor NMI
PCI Card Power Control
JTAG Control
FRU/Fan Fault LEDs (2)
Fan Mux
767
Fan Speed Detection
766
Fan Speed Control
PCI Ext Bd Detection
I/O Processor SN Detection

FIG. 12A

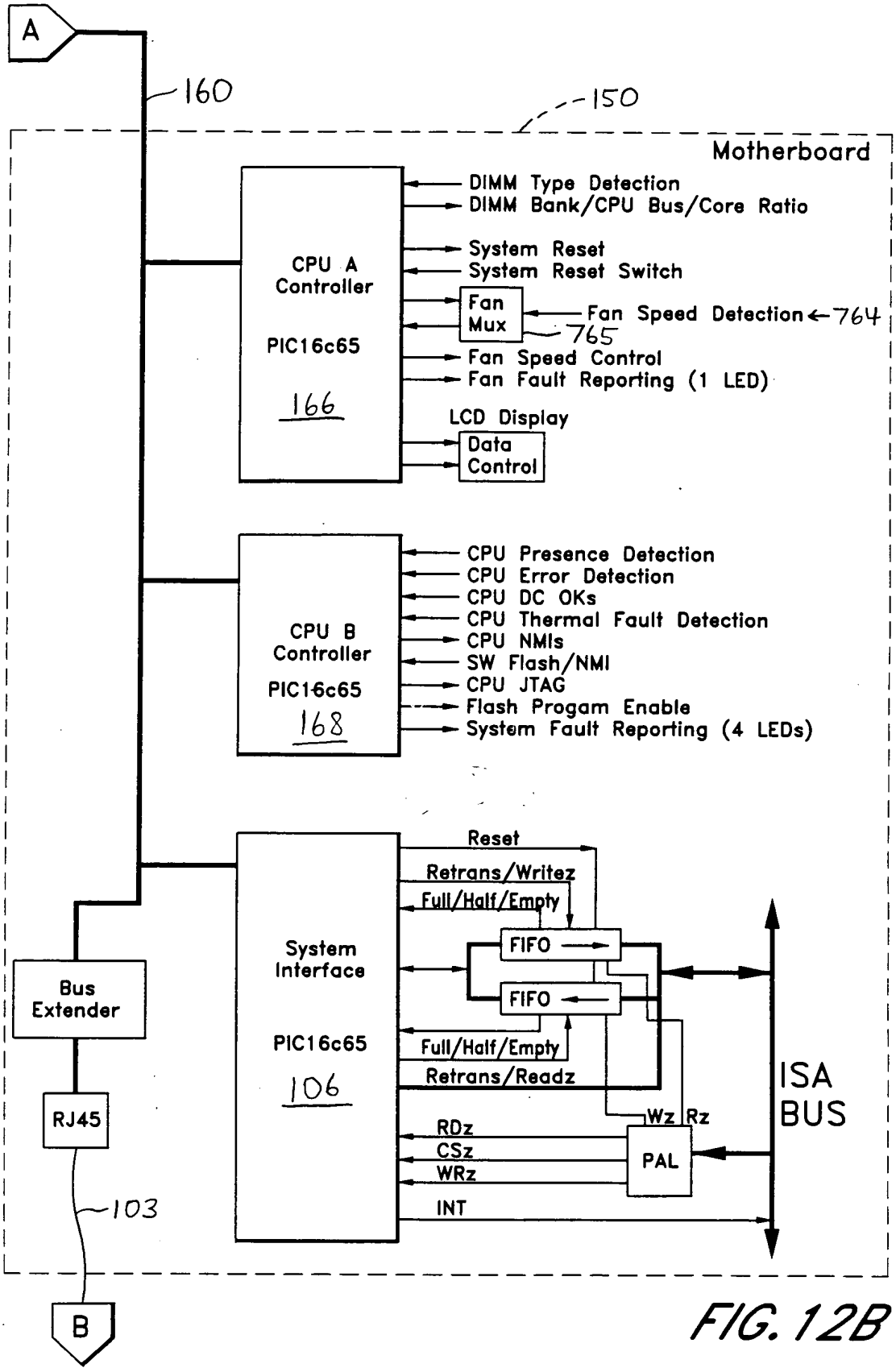
A
160
150
Motherboard
CPU A Controller
PIC16c65
166
DIMM Type Detection
DIMM Bank/CPU Bus/Core Ratio
System Reset
System Reset Switch
Fan Mux
765
Fan Speed Detection
764
Fan Speed Control
Fan Fault Reporting (1 LED)
LCD Display
Data
Control
CPU B Controller
PIC16c65
168
CPU Presence Detection
CPU Error Detection
CPU DC OKs
CPU Thermal Fault Detection
CPU NMIs
SW Flash/NMI
CPU JTAG
Flash Progam Enable
System Fault Reporting (4 LEDs)
System Interface
PIC16c65
106
Reset
Retrans/Writez
Full/Half/Empty
FIFO
FIFO
Full/Half/Empty
Retrans/Readz
Wz
Rz
RDz
CSz
WRz
PAL
INT
ISA BUS
Bus Extender
RJ45
103
B

FIG. 12B

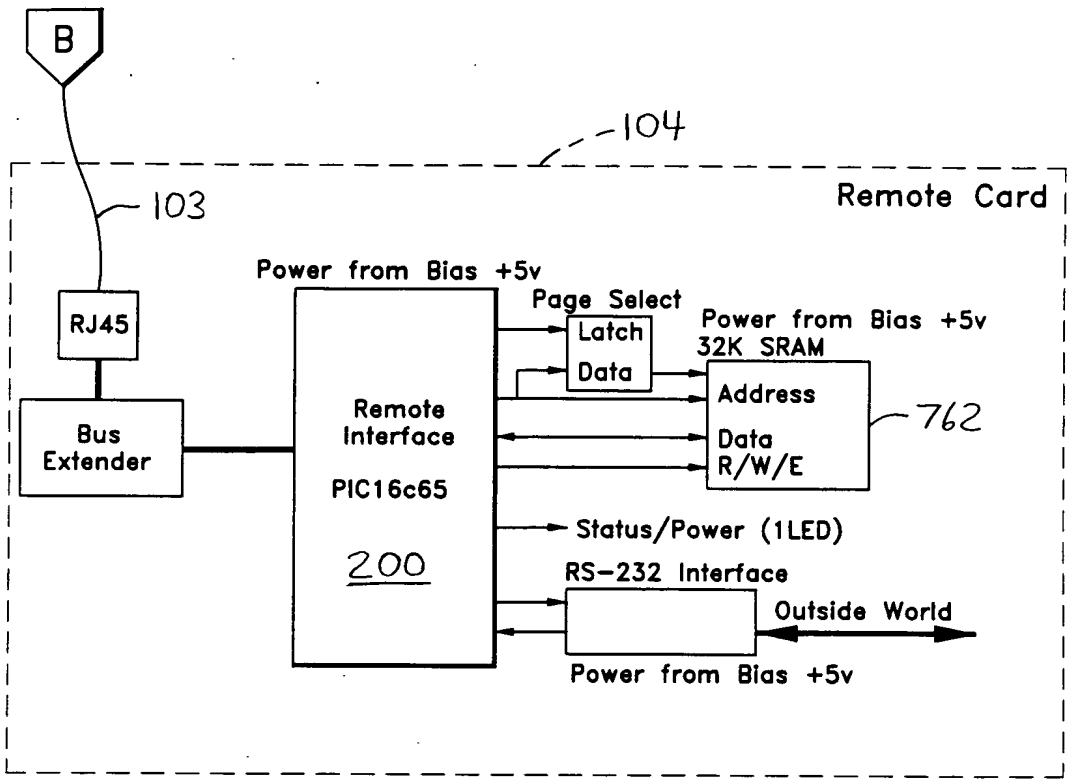

FIG. 12C

Sheet 45 of 68 Patent: 6,094,688

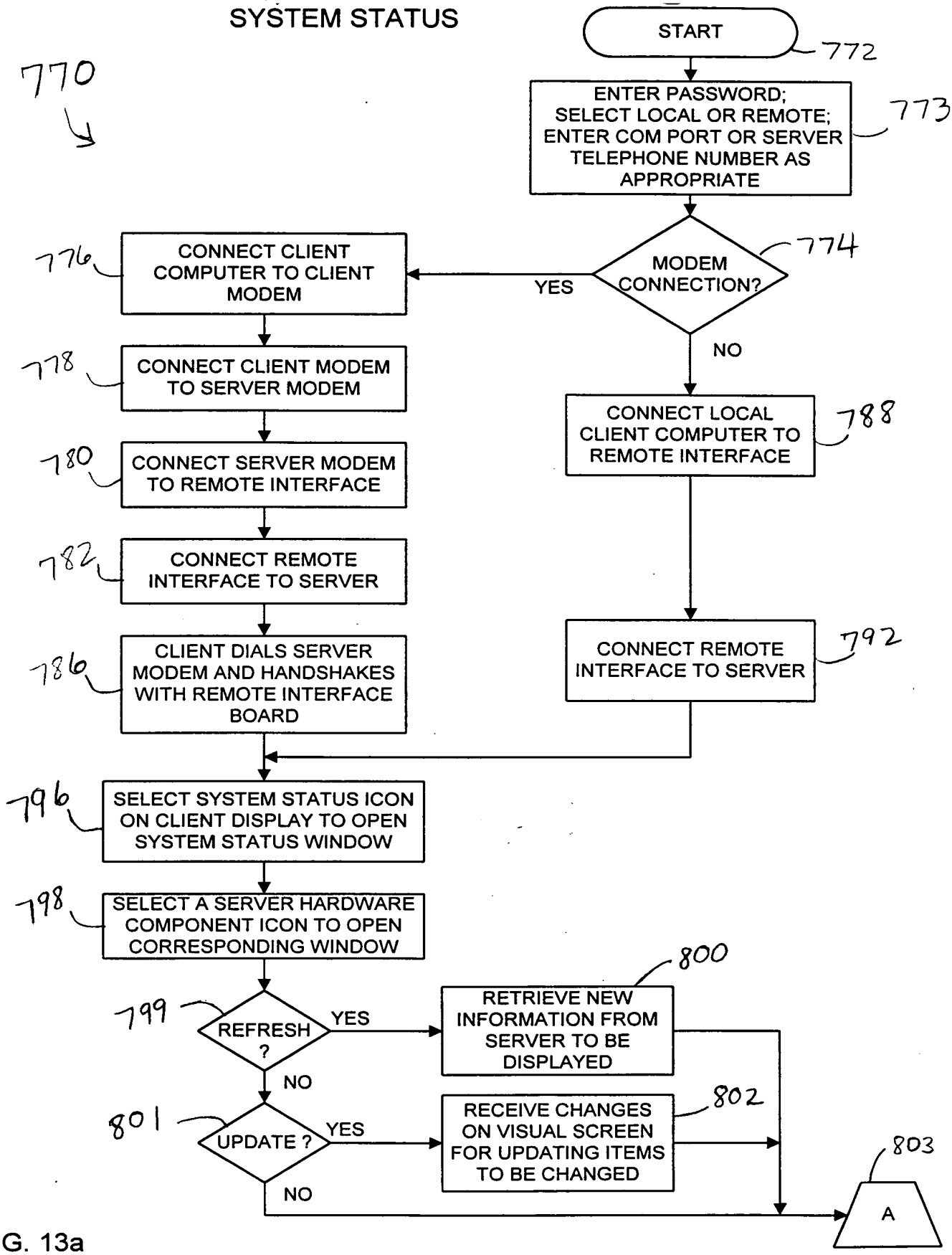
SYSTEM STATUS
770
START
772
ENTER PASSWORD; SELECT LOCAL OR REMOTE; ENTER COM PORT OR SERVER TELEPHONE NUMBER AS APPROPRIATE
773
MODEM CONNECTION?
774
YES
NO
CONNECT CLIENT COMPUTER TO CLIENT MODEM
776
CONNECT CLIENT MODEM TO SERVER MODEM
778
CONNECT SERVER MODEM TO REMOTE INTERFACE
780
CONNECT REMOTE INTERFACE TO SERVER
782
CLIENT DIALS SERVER MODEM AND HANDSHAKES WITH REMOTE INTERFACE BOARD
786
CONNECT LOCAL CLIENT COMPUTER TO REMOTE INTERFACE
788
CONNECT REMOTE INTERFACE TO SERVER
792
SELECT SYSTEM STATUS ICON ON CLIENT DISPLAY TO OPEN SYSTEM STATUS WINDOW
796
SELECT A SERVER HARDWARE COMPONENT ICON TO OPEN CORRESPONDING WINDOW
798
REFRESH ?
799
YES
NO
RETRIEVE NEW INFORMATION FROM SERVER TO BE DISPLAYED
800
UPDATE ?
801
YES
NO
RECEIVE CHANGES ON VISUAL SCREEN FOR UPDATING ITEMS TO BE CHANGED
802
A
803

FIG. 13a

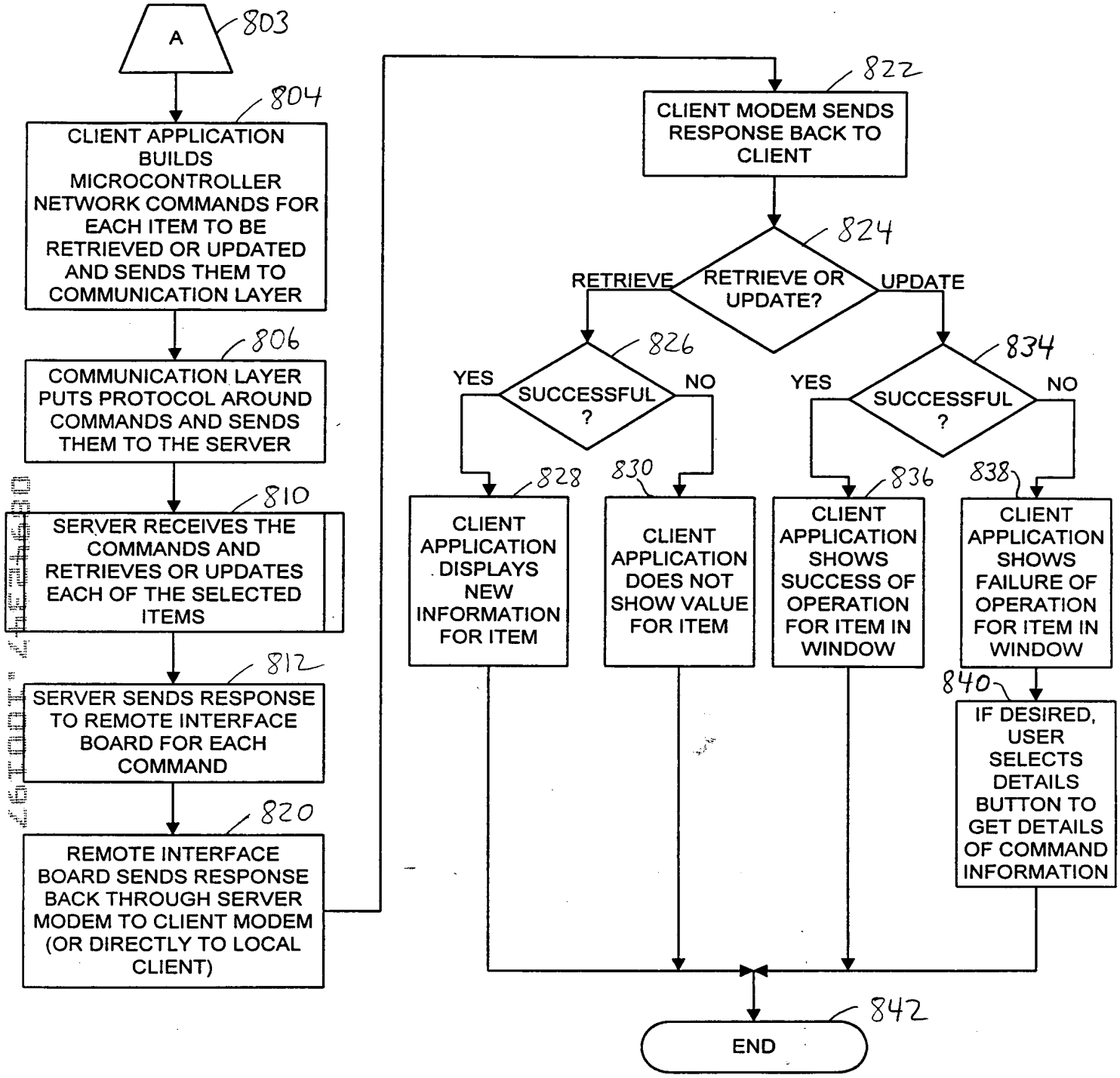
A
803
804
CLIENT APPLICATION BUILDS MICROCONTROLLER NETWORK COMMANDS FOR EACH ITEM TO BE RETRIEVED OR UPDATED AND SENDS THEM TO COMMUNICATION LAYER
806
COMMUNICATION LAYER PUTS PROTOCOL AROUND COMMANDS AND SENDS THEM TO THE SERVER
810
SERVER RECEIVES THE COMMANDS AND RETRIEVES OR UPDATES EACH OF THE SELECTED ITEMS
812
SERVER SENDS RESPONSE TO REMOTE INTERFACE BOARD FOR EACH COMMAND
820
REMOTE INTERFACE BOARD SENDS RESPONSE BACK THROUGH SERVER MODEM TO CLIENT MODEM (OR DIRECTLY TO LOCAL CLIENT)
822
CLIENT MODEM SENDS RESPONSE BACK TO CLIENT
824
RETRIEVE OR UPDATE?
RETRIEVE
UPDATE
826
SUCCESSFUL ?
YES
NO
828
CLIENT APPLICATION DISPLAYS NEW INFORMATION FOR ITEM
830
CLIENT APPLICATION DOES NOT SHOW VALUE FOR ITEM
834
SUCCESSFUL ?
YES
NO
836
CLIENT APPLICATION SHOWS SUCCESS OF OPERATION FOR ITEM IN WINDOW
838
CLIENT APPLICATION SHOWS FAILURE OF OPERATION FOR ITEM IN WINDOW
840
IF DESIRED, USER SELECTS DETAILS BUTTON TO GET DETAILS OF COMMAND INFORMATION
842
END

FIG. 13b

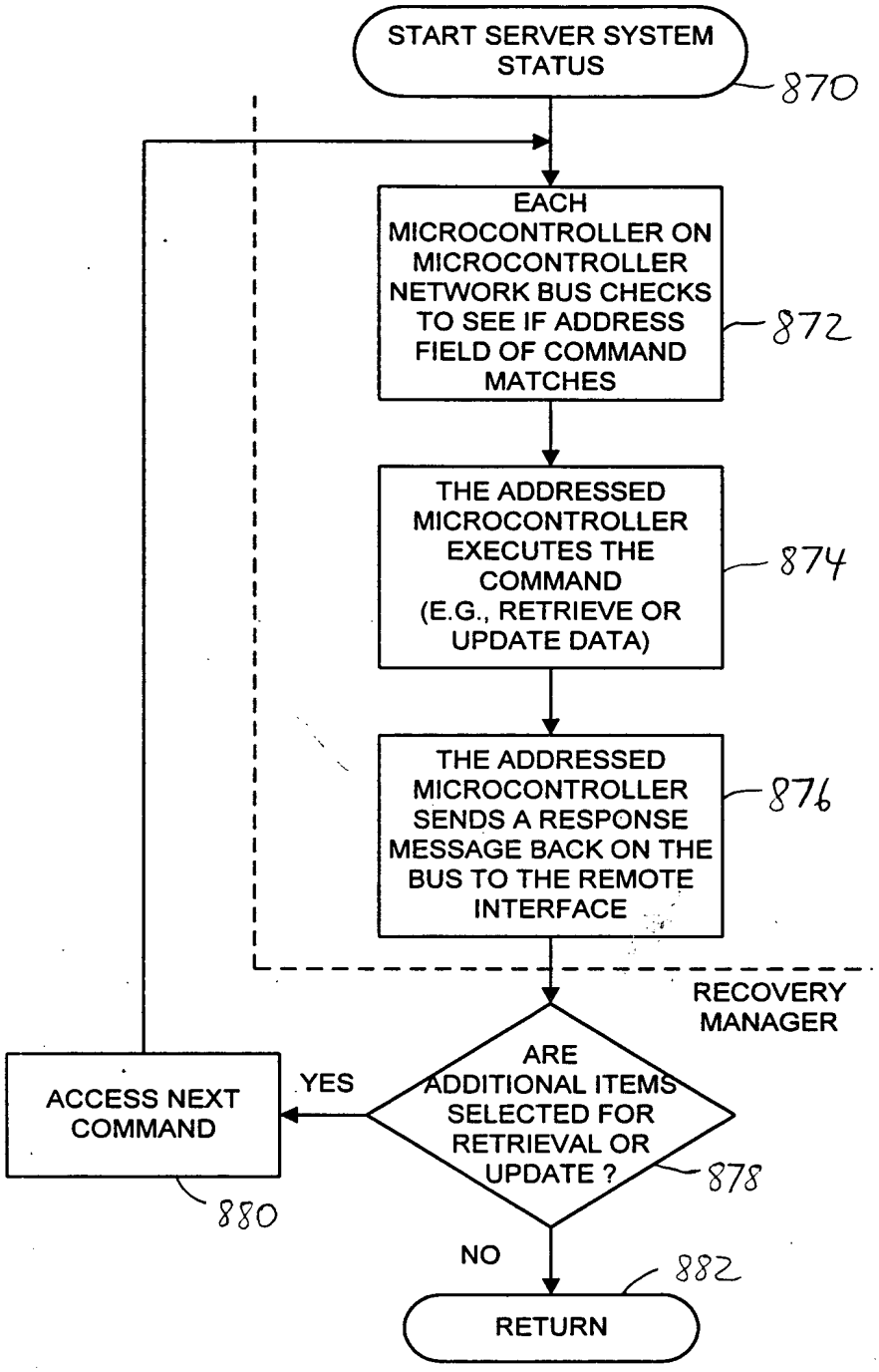
810
START SERVER SYSTEM STATUS
870
EACH MICROCONTROLLER ON MICROCONTROLLER NETWORK BUS CHECKS TO SEE IF ADDRESS FIELD OF COMMAND MATCHES
872
THE ADDRESSED MICROCONTROLLER EXECUTES THE COMMAND (E.G., RETRIEVE OR UPDATE DATA)
874
THE ADDRESSED MICROCONTROLLER SENDS A RESPONSE MESSAGE BACK ON THE BUS TO THE REMOTE INTERFACE
876
RECOVERY MANAGER
ARE ADDITIONAL ITEMS SELECTED FOR RETRIEVAL OR UPDATE ?
878
YES
ACCESS NEXT COMMAND
880
NO
882
RETURN

FIG. 14

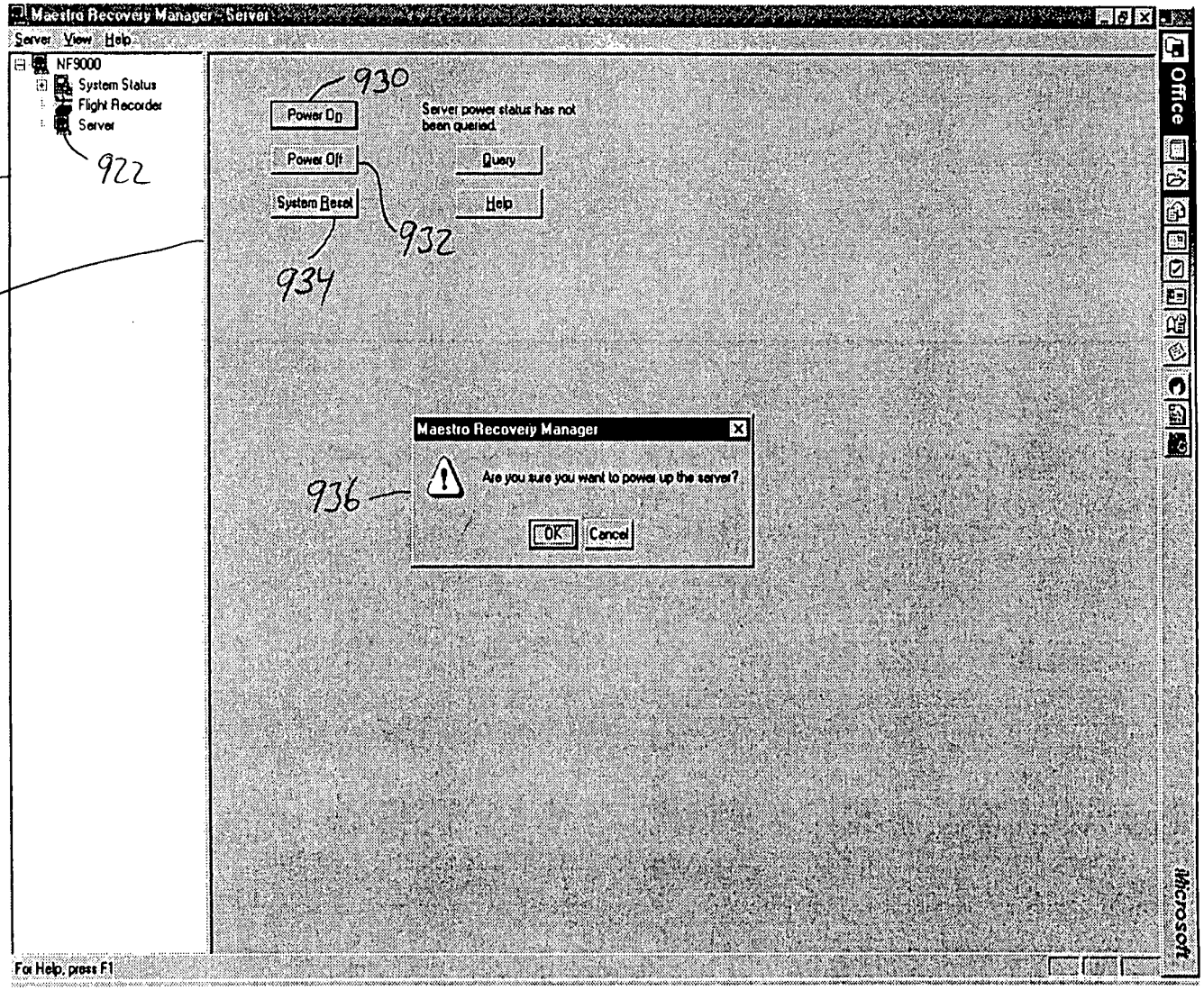
Maestro Recovery Manager - Server
Server View Help
NF9000
System Status
Flight Recorder
Server
920
922
928
930
Power On
Power Off
System Reset
Server power status has not been queried.
Query
Help
932
934
Maestro Recovery Manager
936
Are you sure you want to power up the server?
OK
Cancel
Office
Microsoft
For Help, press F1

FIG. 15

26T00T" 2hE2h680

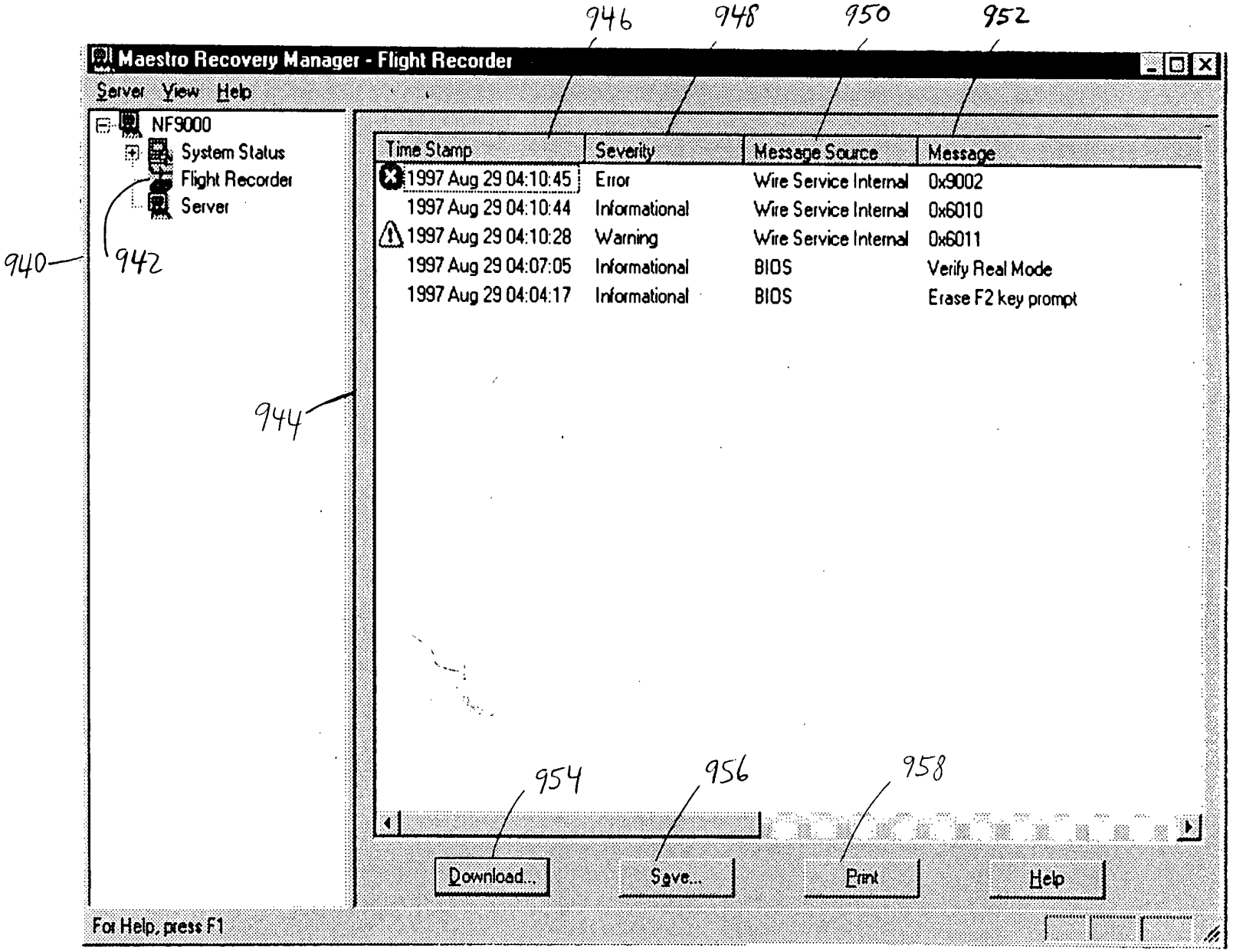

FIG. 16

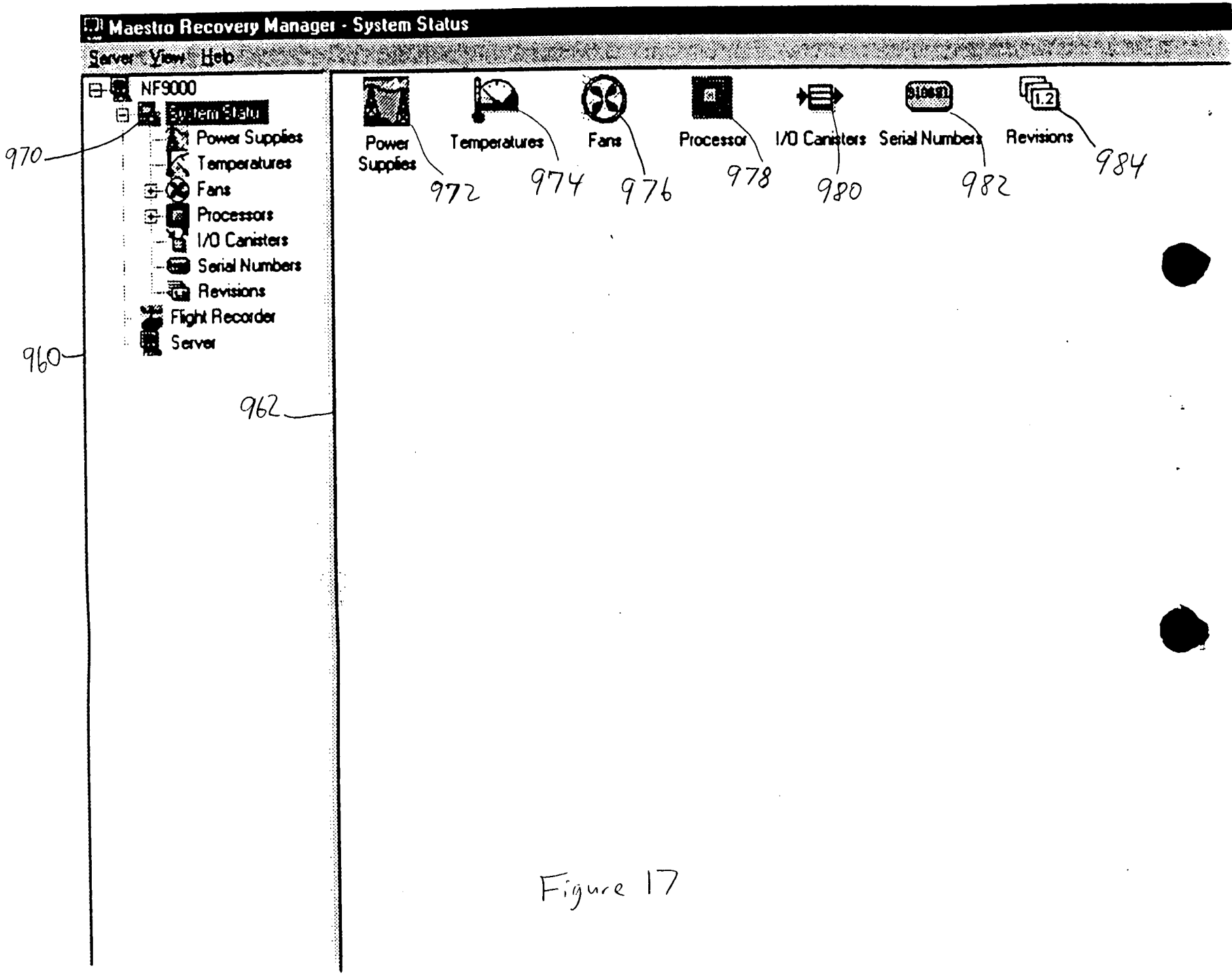
Maestro Recovery Manager - System Status
Server View Help
NF9000
System Status
Power Supplies
Temperatures
Fans
Processors
I/O Canisters
Serial Numbers
Revisions
Flight Recorder
Server
970
960
962
Power Supplies
Temperatures
Fans
Processor
I/O Canisters
Serial Numbers
Revisions
972
974
976
978
980
982
984

Figure 17

26TOOT "2hE2h680

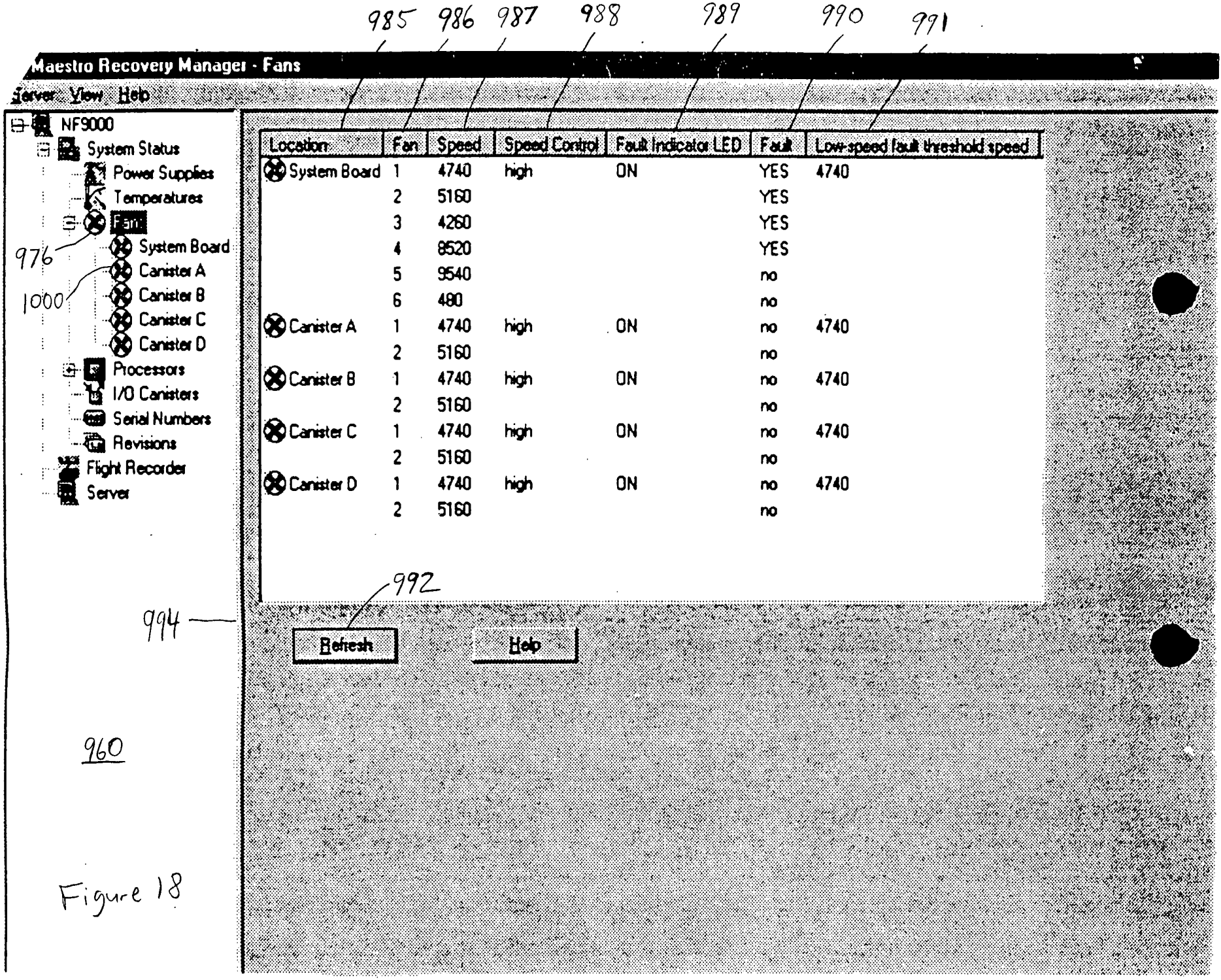

Figure 18

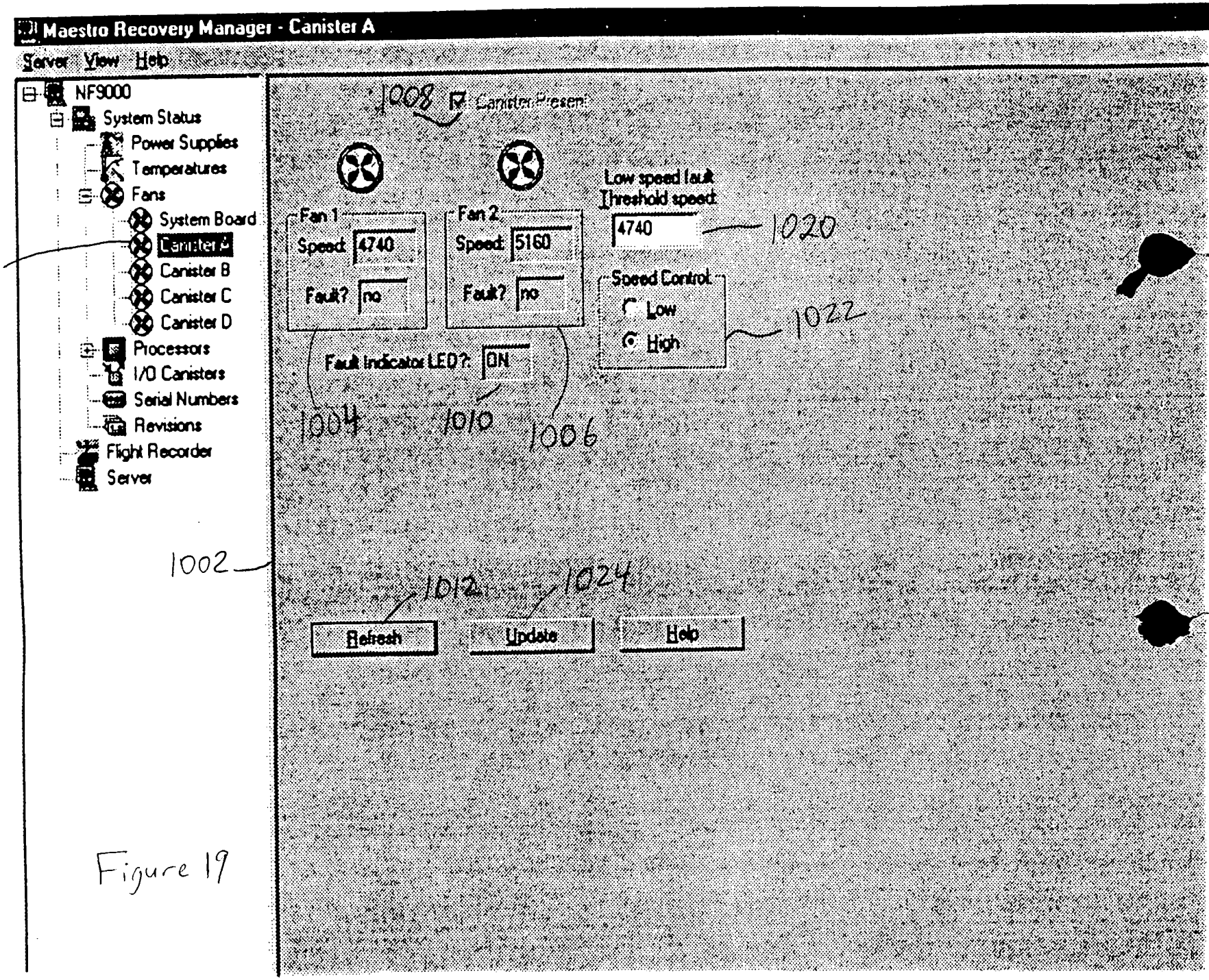
Maestro Recovery Manager - Canister A
Server View Help
NF9000
System Status
Power Supplies
Temperatures
Fans
System Board
Canister A
Canister B
Canister C
Canister D
Processors
I/O Canisters
Serial Numbers
Revisions
Flight Recorder
Server
1000
1002
1004
1006
1008
Canister Present
Fan 1
Speed: 4740
Fault? no
Fan 2
Speed: 5160
Fault? no
Low speed fault Threshold speed:
4740
1020
Speed Control
Low
High
1022
Fault Indicator LED?: ON
1010
1012
1024
Refresh
Update
Help

Figure 19